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THE CULTIVATION OF MEDICINAL PLANTS IN THE UNITED STATES.

L. E. SAYRE.

THE purpose of this paper is to call attention to the importance of agitating or keeping alive the question of growing medicinal plants in the United States. It is not the first time the writer has referred to this subject. Indeed, he has not only presented papers to the Academy, but for a number of years has written numerous articles urging the value of medicinal plant growing. Other states have taken up the subject seriously, but Kansas, almost the first to agitate the question, has done practically nothing to further the project. During the summer of 1915 the writer visited a number of states in the East and South to study the development of the industry, and his report was published in the *Western Drug Record,* November, 1915, where he referred to the cultivation of cannabis, hyoscyamus, belladonna, stramonium, digitalis, hydrastis, ginseng and other plants which practically demonstrated what may be accomplished. If our markets could have been supplied at home by such medical plant products, cultivated in this country, as, for example, colchicum (seed and root) and belladonna, we should not have to be paying, as we now do, the exhorbitant prices for them.

Belladonna root could be bought before the war for 40 cents per pound; now it is quoted at $6.50 per pound. Colchicum root, which brought about 35 cents per pound, is now quoted at $2.15 per pound. Colchicum seed, formerly about 35 cents per pound, is now bringing $2.40 per pound. This showing of rise in prices extends along the whole line of medicinal plants that might have been cultivated in this country in sufficient quantity to supply our markets.

Incidentally I may mention in passing that I have inspected one little garden of one-half acre of golden seal, or hydrastis, which is found on the banks of the Kalamazoo river, in Michigan. The products from this little covered garden brings to the gardener about $2,000 a year. Hydrastis is now selling in the neighborhood of five dollars a pound.

I could prolong this article to much greater length to prove the position that I have taken, that it would be a profitable thing to cultivate the raising of our own medicinal plants in this country, but I shall not do more than call attention to the correspondence I have had with Mr. W. W. Stockberger, plant physiologist of the Bureau of Plant Industry, Washington, D. C., in which a discussion was carried on with regard to the establishment of a medicinal plant garden in connection with the school of pharmancy of the University of Kansas. I desire to quote from his letter in full to show the position this eminent authority takes with regard to the matter:

"The establishment and proper support of a medicinal plant garden as an adjunct to the college of pharmacy of your University should be of direct and practical benefit (*a*) to the students, (*b*) to the University, (*c*) to the people of the state. The students should profit largely from such an enterprise through the fact that they are brought into direct contact with medicinal plants in their living state, and learn at first hand the processes through which the fresh plant material must pass before it becomes the finished drug. Thus they will gain a working basis for their ideas regarding the necessity for the high standard of purity in crude drugs, as well as with respect to the opportunities for sophistication or impairment of quality through faulty methods of preparation and handling. Their interest and appreciation of materia medica will receive a great stimulus through their contact in an objective way with crude drugs during their preparation. Very important to the students also will be the grounding in the economics of the crude-drug trade which they will receive through the proper course of instruction which can be given in connection with the garden. The student who makes a careful record of the expenditure of labor (preferably his own) necessary to produce a given quantity of drug, and then, after marketing the same, deducts from his return a fair allowance for his work, will not be likely to become infected with the erroneous ideas now only too prevalent concerning the enormous profits to be derived from the commercial production of medicinal plants.

"To the University a medicinal plant garden is an invaluable aid and resource in the teaching of materia medica, pharmacognosy, botany and forestry. The medicinal plant garden will furnish much of the living material necessary for the first year's work in botany, and in the pharmacy school a double purpose will be served by using medicinal plants as working materials in teaching morphology and general plant histology. A medicinal garden also offers the student the means for pursuing the study of the production of the actual drugs in the field and practice in their collection and preparation. The supply of living plants which can be obtained from the garden will enormously increase the facilities for research work by the students of pharmacy. Most of the specifications regarding time and method of collecting, curing and preserving crude drugs are based on tradition and not on scientific experiment, and the determination of the relative value of our present requirements with respect to the preparation of drugs offers an almost limitless field of research. In another direction, also, the study of the variation of the active principle among different species of a genus, or even among different individuals of the same species, affords great possibilities. The work on belladonna now being conducted by Mr. Sievers, of this office, is an illustration of this type of research, opportunities for which are practically without number, and many of which may be evident to your students through their medicinal plant garden. By this means not only will the effectiveness of the teaching be increased, but the interest and appreciation of students in this line of work will be aroused and held, and both of these factors are quite in harmony with the higher interests of the University. The institution will also gain credit from a consideration of ten points mentioned in the following paragraph:

"The establishment of a medicinal plant garden in connection with the college of pharmacy of your University is of direct value to the people of your state in many ways, a few of which may be briefly set forth:

"It will furnish information regarding the medicinal plants which are adapted for cultivation in Kansas, and thus provide a body of information invaluable as a guide to the agricultural population of the state. Such information will be of especial value in the immediate future, owing to the recognized necessity for wider diversification of the agriculture of this region.

"This garden, properly directed, will point the way to new agricultural industries which, though relatively small as compared with staple crops, yet contribute to a diversified agriculture, and afford opportunities for an individual here and there to add to his income or better utilize the agricultural facilities which he already possesses.

"By more widely diffusing knowledge respecting medicinal plants, this garden should lead to a fuller utilization of natural resources of the state, and should be the means not only of training the students who are to be pharmacists along these lines, but also of inculcating a wider interest in these resources and the dissemination of knowledge regarding them and their inherent possibilities.

"If the garden is conducted on a sufficiently large scale it will furnish data on the production of drug plants which when properly prepared and disseminated will safeguard the people of the state from loss through ill-considered ventures in drug-plant cultivation. This country is full of talk about enormous profits to be made from growing medicinal plants, all of which means nothing if it cannot be supported by positive concrete evidence of profits realized. Thus the medicinal plant garden, working perhaps along lines somewhat similar to those now being followed by the Bureau of Plant Industry, would collect trustworthy data on the cost of production and possible profits to be realized under the specific conditions existing in your state."

I have stated that other states have led in this enterprise, while Kansas has been apathetic. The schools of pharmacy of Philadelphia, Montana, Nebraska, Wisconsin, Minnesota, etc. have made this medicinal plant culture a very important feature in their pharmaceutical and medical work. One of the most up-to-date gardens I have had the pleasure of examining is located at the University of Minnesota, where there is not only a garden of about three acres and a covered space of about three-fourths of an acre, but also a large greenhouse connected with the college of pharmacy, which the medical profession, as well as the drug trade, has seen fit to not only acknowledge of great value, but from a commercial as well as a scientific point of view it has been exceedingly beneficial in every respect.

I regret to say that the appeals of the dean of the school of pharmacy of the University of Kansas for a botanical garden for medicinal plants and for a properly constructed greenhouse thus far have not been permitted to come before the legislature. I feel that this is a very great mistake, but until we can convince the public that such a demand as I felt myself to be worthy of bringing to the notice of the legislature, we shall still remain as we are now, very backward in this most worthy enterprise.

UNIVERSITY OF KANSAS, LAWRENCE.

ISOLATION OF TOXIC PRINCIPLES OF COFFEE, AND THE DETERMINATION OF THEIR TOXICITY.

L. E. SAYRE.

IN 1907 the writer published, in Merck's Report, an article on the toxic principle of coffee, and since that time, in the Transactions of this Society, he has had articles on the same subject, so that he has deemed it fit to present another article, bringing forth more recent work on the subject.

The cause of toxicity of coffee has long been a mooted question. At first the toxicity was believed to be due to caffeine, but it was quickly recognized that the symptoms that sometimes follow the use of coffee are not the same as those resulting from an equivalent amount of caffeine, as is seen from the following examples:

First. Persons who are affected with headache, insomnia, nervousness, etc., by the use of coffee are often similarly affected by the mere breathing of the vapors given off during the boiling of coffee.